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| <p>(21) International Application Number: PCT/FI99/00805</p> <p>(22) International Filing Date: 30 September 1999 (30.09.99)</p> <p>(30) Priority Data:<br/>982109 30 September 1998 (30.09.98) FI</p> <p>(71) Applicant (for all designated States except US): TASOWHEEL OY [FI/FI]; Hepolamminkatu 27, FIN-33720 Tampere (FI).</p> <p>(72) Inventor; and<br/>(75) Inventor/Applicant (for US only): LAAJA, Risto [FI/FI]; Sillansalmentie 9, FIN-36240 Kangasala (FI).</p> <p>(74) Agent: NIEMINEN, Taisto; Patenttitoimisto T Nieminen Oy, Kehräsaari B, FIN-33200 Tampere (FI).</p>                                       |                  | <p>(81) Designated States: CA, JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p><b>Published</b><br/>With international search report.<br/>In English translation (filed in Finnish).</p> |
| <p>(54) Title: VALVE</p> <p>(57) Abstract</p> <p>A valve comprising a valve box (1) with an inlet (5) and an outlet (6) port and a cylindrical shut-off part (4), rotatable around its longitudinal axis (14), which can be placed into the said box and removed from it longitudinally. The shut-off part (4) has a port (8) running crosswise in regard to its longitudinal axis (14) through a cylinder while the port is open to one cylinder side, and that the shut-off part is mainly shutting-off the valve outlet port.</p> <div data-bbox="958 1134 1380 1491"> </div> <div data-bbox="1006 1554 1315 1911"> </div> |                  |   |

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## VALVE

The invention relates to a liquid regulating valve especially designed for regulation of the flow of pulp in connection with a paper machine, particularly as a valve of the dilution headbox.

Different types of valves are known, where the construction of the shut-off part varies according to the use and what kind of a characteristic curve for the valve is aimed at. For pulp regulation valves have been used, to the stem of which for regulation purpose a linear motion is brought. The stem linear motion shuts-off or opens the port. The problem has been accumulation of pulp in the valve causing change in the properties of flow and the pulp to wedge or pierce through onto the sliding surfaces of the regulating stem or the corresponding shut-off part. The valve has then got stuck. Likewise, the problem has been the valve wearing out due to the particles of coating compounds and fillers in the pulp.

By means of a valve according to this invention the existing problems are avoided and the invention is characterized in that the shut-off part is a cylinder rotated around its longitudinal axis and having a crosswise port running through the cylinder in regard to the longitudinal axis so that it is open to one side of the cylinder, the shut-off part is mainly shutting off the valve outlet opening, while the inlet port to the valve is open, the port to and the port from the shut-off part are substantially on the same level, at least one of the ports in the body is sidewise deviated from the centre line of the shut-off part to the side, the deviation direction is the opposite or the same lateral direction, to which the port is open in valve operational position, the port can be removed from the box longitudinally.

The advantage of the invention is that on the most used portion of the characteristic curve the flow of pulp takes place in a valve cleaning manner so that no fibres accumulate in the valve

inner parts, the pulp flows with a small loss and the dependency of the rate of flow on the stem rotation is easily determined or known. Due to the construction the wear and tear of valve lessens and, likewise, due to the construction, the shut-off part is easily removed from the box body.

In the following the invention is disclosed with reference to the enclosed drawing, where

Fig. 1 is the valve body.

Fig. 2 is the valve body viewed from the port direction.

Fig. 3 is the valve cross-sectioned in direction A - A.

Fig. 4 is the valve body from above.

Fig. 5 is the valve cross-sectioned in direction I - I.

Fig. 6 is the valve shut-off part.

Figures 1 and 2 show a valve with a body that has an inlet and an outlet 5, 6 and a cylindrical box for the shut-off part. On top of the body there is a removable cover 2 with attachment flange 10, which can be removed from the body 1 in removing the cover.

Figure 3 shows valve body 1 and shut-off part 4 cross-sectioned along line A - A that runs at the level with the centre line of inlet 5 and outlet 6. The shut-off part is of rotating type. Figure 3 illustrates that the inlet 5 and outlet 6 in body 1 are not on the same line though on the same level. There is between their centre lines a sideward deviation so that at least one opening 5 has moved a distance x sideward from the shut-off part rotation centre line 14. This fact is of importance for the formation of the characteristic curve and especially for the wanted property, i.e. generation of pressure loss to the greatest part near the shut-off part trailing edge. The pulp flows through port 5 to port 6 and the shut-off part mainly shuts the port 6, while port 5 remains open. Also the latter port 6 can be shifted sideward from the shut-off part centre line in either direction. Thus the distribution of valve speed can be made more even and, accordingly, the wear and tear of the valve parts reduced.

In figure 3 also the bottom groove 11 of shut-off part 4 opening 8 is visible, actually straight in the figure. Alternatively it can be made concave or convex using different curve forms or combinations of the same. In this way it is possible to influence the speed and direction of flow in the valve outlet 6 and to design the valve as little wearing as possible.

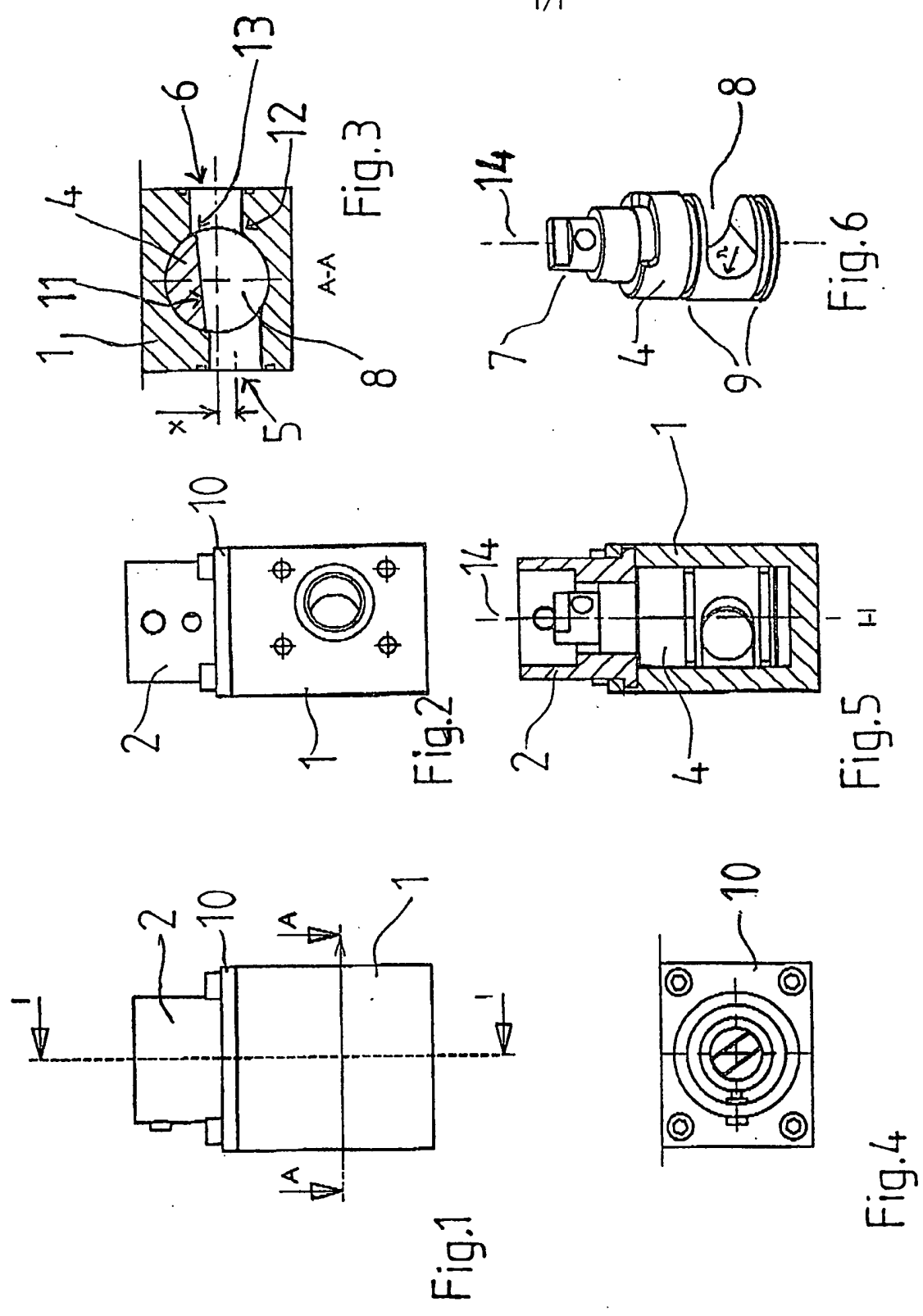
Figure 3 also shows edge 12 of outlet 6 in the body and the trail-ing edge 13 of opening 8 in the shut-off-part 4, and in making these edges bevel or round it is possible to influence the direction and wear of flow.

Figure 4 shows the valve body viewed from above and in figure 5 the body is cross-sectioned along line I - I, while the shut-off part 4 is not cross-sectioned. When shut-off part 4 is in the cylindrical box, it has for the O-ring seals grooves 9 only above and below the port. When the valve is shut-off completely, the cylindrical surface of shut-off part 4 is fully in front of port 6. There is between these surfaces no seal, so complete shut-off of the valve is not so sure. In the use of the valve complete shut-off is not required.

Figure 6 shows a shut-off part 4 according to the invention, which has a through-flow port 8 open to one side. The main part of port 8 is made by constant radius  $r$  and its centre line inter-sects centre line 14 of shut-off part 4. The constant radius portion of port 8 can also be shifted sideward so that its centre line is on either side of the shut-off part centre line 14. In the most advantageous embodiment the radius of ports 5 and 6 is substantially the same as radius  $r$  of port opening 8 bottom.

## CLAIMS

1. A valve comprising a valve box (1) with an inlet (5) and an outlet (6) port and a cylindrical shut-off part (4), rotatable around its longitudinal axis (14), which can be placed in the said box and removed from it longitudinally, **characterized** in that shut-off part (4) has a port (8) running crosswise in regard to its longitudinal axis (14) through a cylinder so that the port is open to one cylinder side and that the shut-off part (4) is mainly shutting off the valve outlet (6).
2. A valve according to claim 1 **characterized** in that inlet (5) and outlet (6) port in valve box (1) is substantially at the same level.
3. A valve according to claim 1 **characterized** in that at least one port (5) or (6) is deviated sideways from the shut-off part centre line (14) so that the deviation direction is the opposite or the same lateral direction, to which port (8) is open in the working position of the valve.
4. A valve according to any of the previous claims 1 - 3 **characterized** in that the shut-off part (4) port (8) is a groove, the radius  $r$  of which bottom is substantially the same as the radius of the valve inlet (5) and outlet (6) port.
5. A valve according to any of the previous claims 1 - 4 **characterized** in that the bottom line (11) of the shut-off part (4) port (8) has forms which are either straight or curved or combinations of the same.
6. A valve according to any of the previous claims 1 - 5 **characterized** in that the edge of the valve outlet (6) has a bevel or a rounding (12) and/or the shut-off port (8) trailing edge has a bevel or a rounding (13).





## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 99/00805

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: F16K 5/04

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: F16K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No. |
|-----------|--|-----------------------|
| X         | GB 1408988 A (PAUL DAVID WURZBURGER),<br>8 October 1975 (08.10.75), page 2,<br>line 120 - line 129, figure 1, pos. 14-16,65<br><br>--<br>----- | 1,2                   |



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| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
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